GEORGIA INSTITUTE OF TECHNOLOGY
Engineering Experiment Station

PROJECT INITIATION

Date January 4, 1967

Project Title: Renovate, Retrofit and Supply Services for MPS-29-Radar

Project No.: A-990

Project Director: Robert M. Goodman, Jr.

Sponsor: U. S. Army Materiels Command, Harry Diamond Lab, Wash. D. C. 20438

Effective: 15 Dec 1966 Estimated to run until: 14 June 1967

Type agreement: Contract No. DA/G39-67-C-0032

Amount: $30,035

Reports: Financial Management Report, Form DD 1097
Monthly Letter Progress Report

Contact Person: Contracting Officer, ~~Mr. W. B. Grose~~ Mr. Frank Weiss
U. S. A. Materiel Command
Harry Diamond Lab
Washington, D. C. 20438

Assigned to Electronics Division, Radar Branch Division

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REPORTS
300. A-990

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GEORGIA INSTITUTE OF TECHNOLOGY
Engineering Experiment Station

PROJECT TERMINATION

Date May 23, 1968

PROJECT TITLE: Renovate, Retrofit and Supply Services for MPS-29-Radar

PROJECT NO: A-990

PROJECT DIRECTOR: F. B. Dyer

SPONSOR: U. S. Army Materials Command, Harry Diamond Laboratories

TERMINATION EFFECTIVE: February 15, 1968

CHARGES SHOULD CLEAR ACCOUNTING BY: May 31, 1968

All charges in excess of the contract amount to be transferred to Division Accounts prior to June 30, 1968

Electronics

REPORTS
300; A-990

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GEORGIA INSTITUTE OF TECHNOLOGY
ENGINEERING EXPERIMENT STATION
ATLANTA, GEORGIA 30332
25 January 1967

U. S. Army Materiel Command
Harry Diamond Laboratories
Washington, D. C. 20438

Attention: Contracting Officer, Mr. W. B. Grose

Subject: Monthly Progress Letter 1, Project A-990
"Renovate, Retrofit and Supply Services for MPS-29 Radar"
Contract No. DAAG39-67-C-0032
Covering the period from 19 December 1966 to 15 January 1967

Gentlemen:

The MPS-29 has not been received and the exact delivery date is not known at this time. The long lead time required by the necessity of having certain of the components reworked by the original manufacturers means that the delay in receiving the equipment may result in complications to the original work schedule.

Initial work has included preparation of prints of the working drawings, tentative work schedules, and preliminary correspondence with the manufacturers of some of the key components.

Mr. Frederick B. Dyer has been appointed Project Director in accordance with discussions with Mr. Frank Weiss. Mr. Robert M. Goodman, Jr. will continue to provide technical support to the project.

Very truly yours,

Frederick B. Dyer
Project Director

FBD:jan

Approved:

R. C. Johnson
Head, Radar Branch

A-990

GEORGIA INSTITUTE OF TECHNOLOGY
ENGINEERING EXPERIMENT STATION
ATLANTA, GEORGIA 30332

20 February 1967

U. S. Army Materiel Command
Harry Diamond Laboratory
Washington, D. C. 20438

Attention: Contracting Officer, Mr. W. B. Grose

Subject: Monthly Progress Letter 2, Project A-990
"Renovate, Retrofit and Supply Services for MPS-29 Radar"
Contract No. DAAG-67-C-0032
Covering the period from 15 January to 15 February 1967

Gentlemen:

Since the MPS-29 Radar has not been received, preliminary work has stopped; however, efforts will be resumed after the radar arrives at Georgia Tech.

Very truly yours

F. B. Dyer
Project Director

FBD:jan

Approved:

R. C. Johnson
Head, Radar Branch

GEORGIA INSTITUTE OF TECHNOLOGY
ENGINEERING EXPERIMENT STATION
ATLANTA, GEORGIA 30332

23 March 1967

U. S. Army Materiel Command
Harry Diamond Laboratories
Washington, D. C. 20438

Attention: Contracting Officer, Mr. W. B. Grose

Subject: Monthly Progress Letter 3, Project A-990
"Renovate, Retrofit and Supply Services for MPS-29 Radar"
Contract No. DAAG39-67-C-0032
Covering the period from 15 February to 15 March 1967

Gentlemen:

The MPS-radar was received in Atlanta on 13 March 1967. The equipment was unloaded at the Moss Trucking Company facilities and driven to Georgia Tech. There was no apparent shipping damage.

The shop van and motor-generator trailer appear to be in reasonably good condition. There has not yet been any attempt to check the electrical functioning of this equipment. The antenna and pedestal show considerable evidence of corrosion and weather damage. It was noted, in particular, that the backing of the reflector has started to separate, two inches of water were found in the inner lens cavity, and the interior of the transmitter receiver box showed considerable deterioration of components.

The spare parts stock has been seriously depleted. An inventory is under way to assess the extent of the problem. The test oscilloscope and the two chairs which were originally with the equipment were not in the van when received.

The program for the next reporting period includes a more detailed assessment of the damage and beginning of the preliminary cleanup and repair.

Very truly yours,

F. B. Dyer
Project Director

FBD:jan

Approved:

R. C. Johnson
Head, Radar Branch

GEORGIA INSTITUTE OF TECHNOLOGY
ENGINEERING EXPERIMENT STATION
ATLANTA, GEORGIA 30332

18 April 1967

U. S. Army Materiel Command
Harry Diamond Laboratories
Washington, D. C. 20438

Attention: Mr. Frank Weiss, Laboratory 100

Subject: Monthly Progress Letter 4, Project A-990
"Renovate, Retrofit and Supply Services for MPS-29 Radar"
Contract No. DAAG39-67-C-0032
Covering the period from 15 March 1967 to 15 April 1967

Gentlemen:

Disassembly of the antenna and pedestal assembly was initiated during this period. The antenna was removed from the pedestal and separated into its major components in order to allow access to the hydraulic system. Disassembly of the hydraulic system is under way. The lead time quoted by Vickers, Inc. on the repair of some hydraulic components is quite long.

The worst damage uncovered thus far involves the parabolic-cylinder reflector. The reflector is constructed from an aluminum honeycomb material backed with sheet material. It is estimated that the backing has separated from approximately 70 percent of the area of the reflector. Techniques for rebonding the surface are under investigation. It will also be necessary to check the surface accuracy before the total extent of the damage can be determined.

The general condition of the rest of the antenna assembly does not appear as bad as originally thought, however, further disassembly is necessary to complete the assessment of the damage.

The motor generator was operated and checked. The only problem located was a bad set of batteries. The rest of the electrical and electronic equipment has not been checked at this time.

The program for the next report period will be a continuation of the cleanup and repair of the antenna assembly and with the electrical and electronic checkout being initiated.

Very truly yours,

F. B. Dyer
Project Director

Approved:

R. C. Johnson
Head, Radar Branch

GEORGIA INSTITUTE OF TECHNOLOGY
ENGINEERING EXPERIMENT STATION
ATLANTA, GEORGIA 30332

18 May 1967

U.S. Army Materiel Command
Harry Diamond Laboratories
Washington, D. C. 20438

Attention: Mr. Frank Weiss, Laboratory 100

Reference: Contract No. DAAG39-67-C-0032

Title: Renovate, Retrofit and Supply Services for MPS-29 Radar

Subject: Monthly Progress Letter No. 5, Project A-990
Covering the period from 15 April to 15 May 1967

Gentlemen:

The mechanical refurbishing of the trailer and the flat beam assembly is approximately 80 percent complete. The materials needed for completion of this work have been ordered.

The major hydraulic components have been removed from the hydraulic system. These components have been inspected and certain ones shipped to the manufacturer for replacement of seals, gaskets, and worn parts. Replacement filters have been ordered for all the filters in the hydraulic system.

Further disassembly of the lens assembly has been delayed until a loss measurement can be made. The electrical surfaces of the lens will be cleaned with a solvent prior to this loss measurement.

The air conditioner and the dehydrator have been tested and found to operate satisfactorily. A new dryer cartridge assembly has been ordered for use with the dehydrator.

The program for the next report period will be a continuation of the cleanup and repair of the antenna assembly and a continuation of the electrical and electronic checkout and repair.

Very truly yours,

F. B. Dyer
Project Director

Approved:

R. C. Johnson
Head, Radar Branch

GEORGIA INSTITUTE OF TECHNOLOGY
ENGINEERING EXPERIMENT STATION
ATLANTA, GEORGIA 30332

15 June 1967

U. S. Army Materiel Command
Harry Diamond Laboratories
Washington, D. C. 20438

Attention: Mr. Frank Weiss, Laboratory 100

Reference: Contract No. DAAG39-67-C-0032

Title: Renovate, Retrofit and Supply Services for MPS-29 Radar

Subject: Monthly Progress Letter No. 6, Project A-990
Covering the period from 15 May to 15 June 1967

Gentlemen:

The mechanical refurbishing of trailer, flat beam assembly, and lens assembly is continuing. Methods of repairing the weather damage to the reflector are still under consideration.

The Transmitter-Receiver Box has been inspected and preliminary mechanical cleanup is complete. A detailed cleanup of the electronic subsystems and replacement of obviously defective components has been completed. The transmitter has not yet been operated; however, there is good reason to believe that both the magnetron and the duplexer assembly are defective. It is expected that the sponsor will furnish replacements for these items.

Various portions of the electronic equipment have been operated with no more than a nominal number of repairs being necessary.

The program for the next report period will be a continuation of the cleanup and repair of the antenna assembly and a continuation of the electrical and electronic checkout and repair.

Very truly yours

F. B. Dyer
Project Director

FBD:jan

Approved:

R. C. Johnson
Head, Radar Branch

GEORGIA INSTITUTE OF TECHNOLOGY
ENGINEERING EXPERIMENT STATION
ATLANTA, GEORGIA 30332

19 July 1967

U. S. Army Materiel Command
Harry Diamond Laboratories
Washington, D. C. 20438

Attention: Mr. Frank Weiss, Laboratory 100

Reference: Contract No. DAAG39-67-C-0032

Title: Renovate, Retrofit and Supply Services for MPS-29 Radar

Subject: Monthly Progress Letter No. 7, Project A-990
Covering the period from 15 June to 15 July 1967

Gentlemen:

All major hydraulic components have either been repaired or are in the process of being refurbished. Necessary parts have been ordered for the remaking of all hydraulic hoses. The main electric drive motor for the hydraulic pump was found to have a defective bearing. This motor is no longer manufactured and thus efforts are underway to rebuild it.

Efforts to find a satisfactory method of repairing the present reflector have been unsuccessful due to very extensive damage which has destroyed both its surface accuracy and structural integrity. It has been recommended to the Technical Monitor at HDL that a new reflector assembly be manufactured. The physical and microwave characteristics of this new reflector would be chosen to match the requirements of the HDL users, as nearly as is practical. It is also suggested that the agency which is supplying the radar be informed of the condition of the reflector and the recommendation be made that the present reflector be scrapped. It will be retained at Georgia Tech pending a decision on that point.

A replacement magnetron has been received from HDL. It is quite old and of uncertain condition but apparently unused. Efforts will be made to use this magnetron in the radar. A new VA250 Klystron was sent at the same time. This Klystron will be used for the necessary bench measurements and then will be used for the local oscillator in the radar.

The program for the next period will be a continuation of the clean-up and testing of the lens, a continuation of the electrical and electronic checkout and repair, and initiation of the design and construction of the new reflector assembly.

Very truly yours,

F. B. Dyer
Project Director

Approved:

R. M. Goodman, Jr.
Technical Coordinator

Copy to:
R. C. Johnson
Hd., Radar Branch

GEORGIA INSTITUTE OF TECHNOLOGY
ENGINEERING EXPERIMENT STATION
ATLANTA, GEORGIA 30332

22 August 1967

U. S. Army Materiel Command
Harry Diamond Laboratories
Washington, D. C. 20438

Attention: Mr. Frank Weiss, Laboratory 100

Reference: Contract No. DAAG39-67-C-0032

Title: Renovate, Retrofit and Supply Services for MPS-29 Radar

Subject: Monthly Progress Letter No. 8, Project A-990
Covering the period from 15 July to 15 August 1967

Gentlemen:

The hydraulic pump, the hydraulic drive motor, and the servo valve are the only major hydraulic components which have not been returned from the manufacturer. Delivery of the hydraulic motor and servo valve is expected to be in August. Delivery of the pump is expected to be in September. The hydraulic hoses have been replaced, new filters are on hand, and reassembly of the hydraulic system will begin when the motor and pump are received. The defective bearing was replaced in the electric drive motor and preliminary tests indicate the motor is now functioning satisfactorily.

Authorization to manufacture a new reflector assembly has been received from HDL. The design is essentially complete for a parabolic cylinder reflector with a one degree vertical beamwidth without any special beam shaping. The reflector is to be constructed of aluminum; the necessary material has been ordered. Written permission to scrap the present reflector has been received from HDL.

The electrical surfaces of the lens were cleaned with a solvent. The residue was found to contain iron oxide and copper in addition to the accumulation of other debris, however, the total amount was quite small. Loss measurements indicate that the loss through the lens is the same, within experimental error, as when the lens was new. The one way loss measured is 3.0 $\pm$ 0.5 dB. The measurement

was made at several frequencies within the band and each of the eleven sectors of the ring switch was checked for unusual losses. It was decided that the lens would be acceptable "as is" and reassembly was initiated.

The replacement magnetron was found to be usable although it exhibits some moding. The duplexer in the system was found to be unusable, however, another was obtained that is satisfactory for the present. The system has been operated with a temporary antenna so that radar returns have been received. The complete transmitter and receiver system has been checked and refurbished where necessary.

The program for the next period will include initiation of the construction of the new reflector assembly and a continuation of the checkout and reassembly of the rest of the radar.

Very truly yours,

F. B. Dyer
Project Director

Approved:

R. M. Goodman, Jr.
Technical Coordinator

Copy to:
R. C. Johnson
Hd, Radar Branch

GEORGIA INSTITUTE OF TECHNOLOGY
ENGINEERING EXPERIMENT STATION
ATLANTA, GEORGIA 30332

September 28, 1967

U. S. Materiel Command
Harry Diamond Laboratories
Washington, D. C. 20438

Attention: Mr. Frank Weiss, Laboratory 100

Reference: Contract No. DAAG39-67-C-0032

Title: Renovate, Retrofit and Supply Services for MPS-29 Radar

Subject: Monthly Progress Letter No. 9, Project A-990
Covering the period from 15 August to 15 September 1967

Gentlemen:

The design of the new parabolic cylinder reflector and support structure is complete. The reflector has been rough machined and finishing operations have been initiated. The reflector support structure has been assembled; however, some finishing is still needed. The support structure is constructed from tubular steel with the reflector attachment designed to allow for the different thermal expansions of the reflector and support structure.

The hydraulic drive motor and the servo valve have been received from the manufacturers. Delivery of the hydraulic pump is now scheduled for the month of October. Since the pump is housed in a separate box, the hydraulic system can be reassembled and preliminary testing accomplished prior to receiving the pump.

Tha jacket of the large cable assembly which connects between the van and the pedestal shows considerable deterioration due to age and weather effects. The spare cable is in essentially the same condition. Both cables are usable electrically; however, it is felt that the cables might fail to operate satisfactorily in wet weather. An effort will be made to seal the splits in the jacket with silicone rubber and then to wrap the cable with a flexible, self-adhering neoprene tape.

The program for the next period will include completion of the new reflector and a continuation of the reassembly of the radar.

Very truly yours,

F. B. Dyer
Project Director

Approved:

R. M. Goodman, Jr.
Technical Coordinator

Copy to:
R. C. Johnson
Hd, Radar Branch

GEORGIA INSTITUTE OF TECHNOLOGY
ENGINEERING EXPERIMENT STATION
ATLANTA, GEORGIA 30332

13 October 1967

U. S. Materiel Command
Harry Diamond Laboratories
Washington, D. C. 20438

Attention: Mr. Frank Weiss, Laboratory 100

Reference: Contract No. DAAG39-67-C-0032

Title: Renovate, Retrofit and Supply Services for MPS-29 Radar

Subject: Monthly Progress Letter No. 10, Project A-990
Covering the period from 15 September to 15 October 1967

Gentlemen:

Work was temporarily stopped on the reassembly of the radar during part of this report period. Efficient work during this period would not have been possible due to the need for the hydraulic pump and other components which have not yet been received. This move was discussed with Mr. Frank Weiss during a visit by F. B. Dyer and R. M. Goodman, Jr., to Harry Diamond Laboratories.

It is anticipated that the pump and other components will be received early in the next report period and reassembly of the radar will be continued at that time.

Very truly yours,

F. B. Dyer
Project Director

Approved:

R. M. Goodman, Jr.
Technical Coordinator

Copy to:
R. C. Johnson
Hd., Radar Branch

GEORGIA INSTITUTE OF TECHNOLOGY
ENGINEERING EXPERIMENT STATION
ATLANTA, GEORGIA 30332

22 November 1967

U. S. Materiel Command
Harry Diamond Laboratories
Washington, D. C. 20438

Attention: Mr. Frank Weiss, Laboratory 100

Reference: Contract No. DAAG39-67-C-0032

Title: Renovate, Retrofit and Supply Services for MPS-29 Radar

Subject: Monthly Progress Letter No. 11, Project A-990
Covering the period from 15 October to 15 November 1967

Gentlemen:

Work on the reassembly of the radar was resumed during this report period. The hydraulic pump has not been received; however, the manufacturer has given assurance that it will be shipped before the end of November. The reassembly schedule is such that effective use of the personnel is possible if this delivery does not slip further.

It is anticipated that the pump will be received early in the next report period and reassembly of the radar will be completed at that time.

Respectfully submitted.

Frederick B. Dyer
Project Director

Approved:

R. M. Goodman, Jr.
Technical Coordinator

Copy to:
R. C. Johnson
Hd., Radar Branch

GEORGIA INSTITUTE OF TECHNOLOGY
ENGINEERING EXPERIMENT STATION
ATLANTA, GEORGIA 30332

2 January 1968

U. S. Materiel Command
Harry Diamond Laboratories
Washington, D. C. 20438

Attention: Mr. Frank Weiss, Laboratory 100

Reference: Contract No. DAAG39-67-C-0032

Title: Renovate, Retrofit and Supply Services for MPS-29 Radar

Subject: Monthly Progress Letter No. 12, Project A-990
Covering the period from 15 November to 15 December 1967

Gentlemen:

The hydraulic pump was received on 22 November and reassembly of the hydraulic system was completed during the next week. The tests of the system disclosed that the hydraulic servo valve was not functioning properly. The servo valve was returned to the manufacturer on 6 December for repair. The manufacturer estimated a date of 9 January for delivery of the repaired servo valve. The system was temporarily assembled without the servo valve and all other hydraulic operations were found to function satisfactorily.

The radar was operated in both the scan mode and in the searchlight mode (without the use of the hydraulic servo) and all major modes were made to operate normally with only a nominal amount of trouble shooting. Radar returns were obtained from objects up to a distance of 1 1/2 miles. This limit was set by the available field of view and not by the radar itself. Some moding problems were noted with the present magnetron, however, it is still functioning.

An extension of the project was requested because of the delay in delivery of the hydraulic components. It is anticipated that the checkout and testing of the radar will continue during the next period. The final completion of the checkout will depend upon the receipt of the hydraulic servo valve and the problems encountered in the installation of that unit.

Respectfully submitted,

Frederick B. Dyer
Project Director

Approved:

R. M. Goodman, Jr.
Technical Coordinator

Copy to: R. C. Johnson
Hd., Radar Branch

GEORGIA INSTITUTE OF TECHNOLOGY
ENGINEERING EXPERIMENT STATION
ATLANTA, GEORGIA 30332

30 January 1968

U. S. Materiel Command
Harry Diamond Laboratories
Washington, D. C. 20438

Attention: Mr. Frank Weiss, Laboratory 100

Reference: Contract No. DAAG39-67-C-0032

Title: Renovate, Retrofit and Supply Services for MPS-29 Radar

Subject: Monthly Progress Letter No. 13, Project A-990
Covering the period from 15 December to 15 January 1968

Gentlemen:

The repaired hydraulic servo valve was received and installed during the first week of January. Additional problems with the hydraulic servo were uncovered during the checkout but these were correctable without further loss of time. The wobblestick mechanism and cursor arm now function satisfactorily. Adjustment and calibration of the searchlight mechanism has been completed.

Detailed testing of the radar has disclosed a number of minor electronic problems. Work is continuing on the correction of these problems. Although it is difficult to measure the performance of the radar accurately because of the questionable quality of the magnetron and the lack of a satisfactory method of determining the transmitted power, the appearance of the display and the calculated sensitivity of the system are both consistent with the expected performance of this system.

It is anticipated that checkout of the radar will be completed during the next report period and that acceptance of the system by the sponsor's representative will be accomplished.

Respectfully submitted:

Frederick B. Dyer
Project Director

Approved:

R.M. Goodman, Jr.
Technical Coordinator

Copy to : R.C. Johnson
Hd., Radar Branch